

AMENDMENTS TO THE CLAIMS

Please cancel Claims 1-18; amend Claim 19; and, add new Claims 37-43 as follows.

LISTING OF CLAIMS

1.-18. (cancelled)

19. (currently amended) A vapor-compression refrigerant cycle system comprising:

a compressor for sucking and compressing refrigerant;

a radiator, provided at a refrigerant discharge side of the compressor, for cooling the refrigerant, the radiator being connected to a refrigerant discharge side of the compressor through a refrigerant circuit;

a decompression device for decompressing refrigerant flowing out of the radiator;

an evaporator for evaporating the refrigerant after being decompressed in the decompression device, by performing heat exchange with a first fluid;

a refrigerant shutting unit disposed in the refrigerant circuit to shut a refrigerant flow from the refrigerant discharge side of the compressor to the radiator;

a heater for heating [[the]] refrigerant, by performing heat exchange with a second fluid different from the first fluid;

a refrigerant supply means for supplying refrigerant to the heater while bypassing the refrigerant shutting unit, the refrigerant supplying means supplies refrigerant from a refrigerant outlet side of the radiator to the heater; and

an energy recovery unit for expanding the refrigerant flowing out of the heater to recover thermal energy in the refrigerant from the heater, wherein:

when a refrigeration cycle where the evaporator has a refrigeration capacity is set, the refrigerant is circulated in this order of the compressor → the radiator → the decompression device → the evaporator → the compressor; [[and]]

when a Rankine cycle where the energy recovery unit recovers the thermal energy is set, the refrigerant shutting unit shuts the refrigerant flow from the refrigerant discharge side of the compressor to the radiator, and the refrigerant is circulated by the refrigerant supply means in this order of the heater → the energy recovery unit → the radiator → the heater[.];

the refrigerant circuit has a first refrigerant path between a refrigerant discharge port of the compressor and the refrigerant shutting unit, and at least a part of the first refrigerant path in the refrigeration cycle is used as a part of a refrigerant suction path for drawing refrigerant to the energy recovery unit in the Rankine cycle;
and

at least a part of a second refrigerant path between a refrigerant suction port of the compressor and the evaporator in the refrigeration cycle is used as a part of a refrigerant discharge path of the energy recovery unit in the Rankine cycle.

20. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein:

the compressor and the energy recovery unit are integrated to form a compressor device; and

the compressor device functions as the energy recovery unit when the refrigerant flowing out of the heater flows into the compressor device.

21. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, wherein the energy recovery unit is connected in parallel with the compressor.

22. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the heater is provided in the refrigerant circuit connecting the compressor and the radiator.

23. (original) The vapor-compression refrigerant cycle system according to claim 19, further comprising a gas-liquid separator for separating the refrigerant flowing out of the radiator into gas refrigerant and liquid refrigerant, wherein,

in the Rankine cycle, the liquid refrigerant separated in the gas-liquid separator is supplied to the heater by the refrigerant supply means.

24. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, further comprising energy storage means for storing energy recovered by the energy recovery unit.

25. (withdrawn) The vapor-compression refrigerant cycle system according to claim 24, wherein the energy storage means includes a capacitor.

26. (withdrawn) The vapor-compression refrigerant cycle system according to claim 24, wherein the energy storage means stores the energy recovered in the energy recovery unit as a mechanical energy.

27. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the energy recovery unit generates an electric energy by use of the recovered energy.

28. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the compressor is driven by an electric motor.

29. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, wherein the compressor is disposed to be driven by plural kinds of driving sources.

30. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, wherein the compressor is disposed to be driven by a driving source other than an electric motor.

31. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, further comprising an auxiliary heater that is provided separately from the heater, for heating the refrigerant by using heat of an exhaust gas discharged from a heat engine.

32. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the heater heats the refrigerant by using waste heat generated by a heat engine.

33. (withdrawn) The vapor-compression refrigerant cycle system according to claim 32, wherein the heater heats the refrigerant by using heat of exhaust gas discharged from the heat engine.

34. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the heater heats the refrigerant by using waste heat generating by equipment mounted on a vehicle.

35. (withdrawn) The vapor-compression refrigerant cycle system according to claim 19, wherein the heater heats the refrigerant by use of a plurality of heat sources.

36. (original) The vapor-compression refrigerant cycle system according to claim 19, wherein the refrigerant contains at least one substance selected from the group consisting of HFC134a, HFC152a, butane, propane, and ammonia, as a main constituent of the refrigerant.

37. (new) The refrigerant cycle system according to claim 19, wherein the energy recovery unit has a refrigerant outlet side which is coupled to a refrigerant path

between the refrigerant shutting unit and the radiator.

38. (new) A refrigerant cycle system comprising:

a compression/expansion device, which has a high pressure port and a low pressure port, and which functions as a compressor for compressing refrigerant drawn from the low pressure port and as an energy recovery unit for expanding refrigerant drawn from the high pressure port to recovery thermal energy in refrigerant;

a radiator, located at a side of the high pressure port of the compression/expansion device, for cooling the refrigerant;

a decompression device for decompressing refrigerant flowing out of the radiator;

an evaporator, located downstream of the decompression device, for evaporating refrigerant from the decompression device by heat-exchanging with air for air-conditioning;

a refrigerant shutting unit located in a refrigerant circuit to shut a refrigerant flow from the high pressure port of the compression/expansion device to the radiator when the compression/expansion device is operated as the energy recovering unit;

a first bypass circuit which connects a refrigerant discharge side of the radiator to the side of the high pressure port of the compression/expansion device while bypassing the refrigerant shutting unit;

a pump for supplying refrigerant to flow through the first bypass circuit from the refrigerant discharge side of the radiator;

a heater for heating the refrigerant supplied by the pump, using a heat source;

a second bypass circuit which connects the low pressure port of the compression/expansion device to the refrigerant suction side of the radiator in the refrigerant circuit;

a control means for controlling a refrigerant flow, wherein

when the compression/expansion device operates as the compressor, the control means controls the refrigerant flow to circulate in this order of the compression/expansion device, the radiator, the decompression device, the evaporator and the compression/expansion device, and

when the compression/expansion device operates as the energy recovery unit, the control means controls the refrigerant flow to circulate in this order of the heater, the compression/expansion device, the second bypass circuit, the radiator and the heater.

39. (new) The refrigerant cycle system according to claim 38, wherein the heater is located between the refrigerant shutting unit and the high pressure port of the compression/expansion device.

40. (new) The refrigerant cycle system according to claim 38, wherein the first bypass circuit is joined to a refrigerant path between the refrigerant shutting unit and the heater, such that a refrigerant flow in the heater, when the compression/expansion device operates as the compressor, is opposite to a

refrigerant flow in the heater when the compression/expansion device operates as the energy recovery unit.

41. (new) The refrigerant cycle system according to claim 38, further comprising

a gas-liquid separator located at the refrigerant discharge side of the radiator,

wherein the first bypass circuit is jointed to the gas-liquid separator such that the pump pumps liquid refrigerant in the gas-liquid separator.

42. (new) The refrigerant cycle system according to claim 41, wherein the gas-liquid separator is located between the radiator and the decompression device.

43. (new) The refrigerant cycle system according to claim 38, wherein the heater is separated from the evaporator.